

U.S. Patent Application Serial No.: 09/963,710
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AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 Claim 1 (Currently Amended): An inspection method of an electric part comprising the
2 steps of:

3 storing a plurality of images of a non-defective electric part in advance; [[and]]

4 storing image consulting data including a plurality of item symbols wherein each of the
5 item symbols corresponds to at least one of the plurality of images;

6 storing normal data including a plurality of sections to be inspected, wherein each of the
7 sections to be inspected corresponds to at least one proper one of the item symbols; and

8 judging whether or not an electric part to be inspected at a section to be inspected is non-
9 defective ~~on the basis of~~ , in dependence upon an image of the electric part to be inspected, the
10 section to be inspected, the image consulting data, and the normal data ~~a plurality of the images~~
11 ~~of a non-defective electric part.~~

1 Claim 2 (Currently Amended): An inspection method of an electric part comprising the

steps of:

storing a plurality of images of a non-defective electric part in advance;

storing image consulting data including a plurality of item symbols wherein each of the item symbols corresponds to at least one of the plurality of images;

storing normal data including a plurality of sections to be inspected, wherein each of the sections to be inspected corresponds to at least one proper one of the item symbols;

comparing an image of an electric part to be inspected at a section to be inspected and [[a]] the plurality of the images of [[a]] the non-defective electric part;

extracting an image most analogous to the image of [[an]] the electric part to be inspected from [[a]] the plurality of the images of [[a]] the non-defective electric part; and

judging whether or not the electric part to be inspected is non-defective ~~on the basis of,~~
in dependence upon the most analogous image, [[and]] the image of the electric part to be inspected, the section to be inspected, the image consulting data, and the normal data.

Claim 3 (Original): An inspection apparatus of an electric junction box having a plurality of mounts on which electric parts are mounted, for inspecting mounting state of the electric parts, said each electric part having a different mark on an outer surface thereof depending upon an item symbol thereof, the inspection apparatus comprising:

image pickup means for picking up an image including said mark of the electric part mounted on the mount;

7 extraction means for (1) storing image consulting data containing a plurality of images
8 including said marks of the electric parts of all the item symbols to be mounted in the electric
9 junction box as a subject of the inspection and normal data indicating the proper item symbols of
10 the electric parts mounted on the corresponding mounts, and for (2) comparing the image
11 including said mark of the electric part mounted on the mount picked up by the image pickup
12 means and the image in the image consulting data, and for (3) extracting the item symbol of the
13 electric part having the most analogous image from the images in the image consulting data; and
14 judgment means for judging the quality of the mounting state of the electric parts on the
15 mount by comparing the item symbol of the electric part having the most analogous image and
16 said normal data.

1 Claim 4 (Original): The inspection apparatus of an electric junction box according to
2 claim 3, wherein the image is a digital information, in which an optical power is indicated with a
3 plurality of grades thereof,

4 the extraction means compares the image including said mark of the electric part mounted
5 on the mount in the electric junction box as a subject of the inspection and the image in the
6 image consulting data by a method of normalization correlation so that the image having the
7 highest correlation value obtained by the method of normalization correlation out of the images
8 is set up to be said most analogous image, and

9 the judgment means judges the quality of the mounting state of the electric parts on the

10 mount by comparing the item symbol of the electric part of the image having the highest
11 correlation value and said normal data.

1 Claim 5 (Currently Amended): An inspection apparatus of an electric junction box
2 having a plurality of mounts on which electric parts are mounted, for inspecting mounting state
3 of the electric parts, said each electric part having a different mark on an outer surface thereof
4 ~~depending upon~~ corresponding to an item symbol thereof, the inspection apparatus comprising:

5 image pickup means for picking up an image_i including said mark_i of ~~[[the]]~~ an electric
6 part mounted on ~~[[the]]~~ a mount to be inspected;

7 extraction means for (1) storing image consulting data including a plurality of item
8 symbols wherein each of the item symbols corresponds to at least one of a plurality of images of
9 non-defective electric parts ~~containing a plurality of images including said marks of the electric~~
10 ~~parts of all the item symbols to be mounted in the electric junction box as a subject of the~~
11 inspection, and storing normal data including a plurality of mounts to be inspected wherein each
12 of the mounts to be inspected corresponds to at least one proper one of the item symbols, and for
13 (2) comparing the image_i including said mark_i of the electric part mounted on the mount to be
14 inspected picked up by the image pickup means and the ~~image~~ images of the non-defective
15 electric parts ~~part having the proper item symbol to be mounted~~ in the image consulting data by a
16 method of normalization correlation, and for (3) extracting the highest correlation value out of
17 the correlation values obtained by the method of normalization correlation; and

18 judgment means for judging the quality of the mounting state of the electric parts on the
19 mount ~~on the basis of~~ in dependence upon the highest correlation value, the image consulting
20 data, and the normal data.

1 Claim 6 (Original): The inspection apparatus of an electric junction box according to
2 claim 4 or 5, wherein the judgment means adds the image including said mark of the electric part
3 properly mounted on the mount, out of the electric parts judged improperly mounted on the
4 mount, to the image consulting data.

1 Claim 7 (Currently Amended): An inspection apparatus of a terminal fittings for
2 inspecting mounting state of the terminal fittings on an insulator, said terminal fittings being
3 mounted at a mount to be inspected on the insulator and an electric wire being pressure-welded
4 to the terminal fittings, the inspection apparatus comprising:

5 image pickup means for picking up an image of the terminal fittings mounted at the
6 mount to be inspected on the insulator;

7 extraction means for (1) storing image consulting data including a plurality of item
8 symbols wherein each of the item symbols corresponds to at least one of a plurality of images of
9 containing a plurality of images of a non-defective terminal fittings mounted on the insulator, and
10 storing normal data including a plurality of mounts to be inspected wherein each of the mounts to
11 be inspected corresponds to at least one proper one of the item symbols, and for (2) comparing

the image of the terminal fittings picked up by the image pickup means and ~~[[a]]~~ the plurality of
the images of ~~[[a]]~~ non-defective terminal fittings in the image consulting data, and for (3)
extracting an image most analogous to the image of the terminal fittings picked up by the image
pickup means from the images in the image consulting data; and

judgment means for judging the quality of the mounting state of the terminal fittings on
the insulator ~~by comparing~~ in dependence upon the most analogous image, ~~[[and]]~~ the image of
the terminal fittings picked up by the image pickup means, the image consulting data, and the
normal data.

Claim 8 (Currently Amended): The inspection apparatus of a terminal fittings according
to claim 7, wherein the image is a digital information, in which an optical power is indicated with
a plurality of grades thereof,

the extraction means compares the image of the terminal fittings picked up by the image
pickup means and a plurality of the ~~image~~ images in the image consulting data by a method of
normalization correlation so that the image having the highest correlation value obtained by the
method of normalization correlation out of the images is set up to be said most analogous image,
~~[[and]]~~

the judgment means judges the quality of the mounting state of the terminal fittings
mounted at the mount to be inspected on the insulator to be good when the correlation value is
equal to or higher than a predetermined threshold ~~while~~ and the item symbol corresponding to the

12 image of the terminal fittings picked up by the image pickup means corresponds, according to the
13 normal data, to the proper item symbol for the mount to be inspected, and
14 the judgement means judges the quality of the mounting state to be no good when the
15 correlation value is lower than the predetermined threshold or when the item symbol
16 corresponding to the image of the terminal fittings picked up by the image pickup means does not
17 correspond, according to the normal data, to the proper item symbol for the mount to be
18 inspected.

1 Claim 9 (Currently Amended): An inspection apparatus of a terminal fittings for
2 inspecting pressure-welding state of an electric wire to the terminal fittings, said terminal fittings
3 being mounted at a mount to be inspected on an insulator and the electric wire being pressure-
4 welded to the terminal fittings, the inspection apparatus comprising:

5 image pickup means for picking up an image of the terminal fittings, to which the electric
6 wire is pressure-welded, mounted at the mount to be inspected on the insulator;

7 second extraction means for (1) storing second image consulting data including a plurality
8 of item symbols wherein each of the item symbols corresponds to at least one of a plurality of
9 images of containing a plurality of images of a non-defective terminal fittings, to which the
10 electric wire is pressure-welded, mounted on the insulator, and storing normal data including a
11 plurality of mounts to be inspected wherein each of the mounts to be inspected corresponds to at
12 least one proper one of the item symbols, and for (2) comparing the image of the terminal

13 fittings, to which the electric wire is pressure-welded, picked up by the image pickup means and
14 ~~[[a]]~~ the plurality of images of ~~[[a]]~~ non-defective terminal fittings, to which the electric wire is
15 pressure-welded, in the second image consulting data, and for (3) extracting an image most
16 analogous to the image of the terminal fittings, to which the electric wire is pressure-welded,
17 picked up by the image pickup means from the images in the second image consulting data; and
18 second judgment means for judging the quality of the pressure-welding state of the
19 electric wire to the terminal fittings, to which the electric wire is pressure-welded, mounted on
20 the insulator ~~by comparing~~ in dependence upon the most analogous image, ~~[[and]]~~ the image of
21 the terminal fittings, to which the electric wire is pressure-welded, mounted on the insulator
22 picked up by the image pickup means, the second image consulting data, and the normal data.

1 Claim 10 (Currently Amended): The inspection apparatus of a terminal fittings
2 according to claim 9, wherein the image is a digital information, in which an optical power is
3 indicated with a plurality of grades thereof,

4 the second extraction means compares the image of the terminal fittings, to which the
5 electric wire is pressure-welded, picked up by the image pickup means and ~~[[a]]~~ the plurality of
6 the images in the second image consulting data by a method of normalization correlation so that
7 the image having the highest correlation value obtained by the method of normalization
8 correlation out of the images is set up to be said most analogous image, and

9 the second judgment means judges the quality of the pressure-welding state of the electric

wire to the terminal fittings mounted at the mount to be inspected to be good when the correlation value is equal to or higher than a predetermined threshold and the item symbol corresponding to the image of the terminal fittings picked up by the image pickup means corresponds, according to the normal data, to the proper item symbol for the mount to be inspected, and

the judgment means ~~while~~ judges the quality of the pressure-welding state to be no good when the correlation value is lower than the predetermined threshold or when the item symbol corresponding to the image of the terminal fittings picked up by the image pickup means does not, according to the normal data, correspond to the proper item symbol for the mount to be inspected.

Claim 11 (Currently Amended): An inspection apparatus of a terminal fittings for inspecting mounting state of the terminal fittings on an insulator and pressure-welding state of an electric wire, said terminal fittings being mounted at a mount to be inspected on the insulator and the electric wire being pressure-welded to the terminal fittings, the inspection apparatus comprising:

image pickup means for picking up an image of the terminal fittings mounted at the mount to be inspected on the insulator;

extraction means for (1) storing image consulting data including a plurality of item symbols wherein each of the item symbols corresponds to at least one of a plurality of images of

10 ~~containing a plurality of images of a~~ non-defective terminal fittings mounted on the insulator, and
11 storing normal data including a plurality of mounts to be inspected wherein each of the mounts to
12 be inspected corresponds to at least one proper one of the item symbols, and for (2) comparing
13 the image of the terminal fittings picked up by the image pickup means and ~~[[a]]~~ the plurality of
14 the images of ~~[[a]]~~ non-defective terminal fittings in the image consulting data, and for (3)
15 extracting an image most analogous to the image of the terminal fittings picked up by the image
16 pickup means from the images in the image consulting data;

17 judgment means for judging the quality of the mounting state of the terminal fittings on
18 the insulator ~~by comparing in dependence upon~~ the most analogous image, ~~[[and]]~~ the image of
19 the terminal fittings picked up by the image pickup means, the image consulting data, and the
20 normal data;

21 second extraction means for (1) storing second image consulting data containing a
22 plurality of images of a non-defective terminal fittings, to which the electric wire is pressure-
23 welded, mounted on the insulator, and for (2) comparing the image of the terminal fittings, to
24 which the electric wire is pressure-welded, picked up by the image pickup means and a plurality
25 of images of a non-defective terminal fittings, to which the electric wire is pressure-welded, in
26 the second image consulting data, and for (3) extracting an image most analogous to the image of
27 the terminal fittings, to which the electric wire is pressure-welded, picked up by the image pickup
28 means from the images in the second image consulting data; and

29 second judgment means for judging the quality of the pressure-welding state of the

30 electric wire to the terminal fittings, to which the electric wire is pressure-welded, mounted on
31 the insulator by comparing the most analogous image and the image of the terminal fittings, to
32 which the electric wire is pressure-welded, mounted on the insulator picked up by the image
33 pickup means.

1 Claim 12 (Currently Amended): The inspection apparatus of a terminal fittings according
2 to claim 11, wherein the image is a digital information, in which an optical power is indicated
3 with a plurality of grades thereof,

4 the extraction means compares the image of the terminal fittings picked up by the image
5 pickup means and a plurality of the image in the image consulting data by a method of
6 normalization correlation so that the image having the highest correlation value obtained by the
7 method of normalization correlation out of the images is set up to be said most analogous image,

8 the judgment means judges the quality of the mounting state of the terminal fittings on the
9 insulator to be good when the correlation value is equal to or higher than a predetermined
10 threshold and the item symbol corresponding to the image of the terminal fittings picked up by
11 the image pickup means corresponds, according to the normal data, to the proper item symbol for
12 the mount to be inspected, and

13 the judgment means ~~while~~ judges the quality of the mounting state to be no good when
14 the correlation value is lower than the predetermined threshold or when the item symbol
15 corresponding to the image of the terminal fittings picked up by the image pickup means does

16 not, according to the normal data, correspond to the proper item symbol for the mount to be
17 inspected,

18 the second extraction means compares the image of the terminal fittings, to which the
19 electric wire is pressure-welded, picked up by the image pickup means and a plurality of the
20 images in the second image consulting data by a method of normalization correlation so that the
21 image having the highest correlation value obtained by the method of normalization correlation
22 out of the images is set up to be said most analogous image, and

23 the second judgment means judges the quality of the pressure-welding state of the electric
24 wire to the terminal fittings to be good when the correlation value is equal to or higher than a
25 predetermined threshold while judges the quality of the pressure-welding state to be no good
26 when the correlation value is lower than the predetermined threshold.

1 Claim 13 (Original): The inspection apparatus of a terminal fittings according to claim 7,
2 8, 11 or 12, wherein the terminal fittings has a pressure-welding part to which the electric wire is
3 pressure-welded and a caulking piece for caulking the electric wire,

4 the image pickup means picks up at least one image out of an image of the pressure-
5 welding part and that of the caulking piece,

6 the image consulting data includes at least one plurality of images out of images of the
7 pressure-welding part and those of the caulking piece, and

8 the extraction means compares at least one image out of an image of the pressure-welding

9 part and that of the caulking piece, which are picked up by the image pickup means, with at least
10 one plurality of images out of images of the pressure-welding part and those of the caulking
11 piece, which are included in the image consulting data.

1 Claim 14 (Original): The inspection apparatus of a terminal fittings according to claim 9,
2 10, 11 or 12, wherein the terminal fittings has a pressure-welding part to which the electric wire
3 is pressure-welded and a caulking piece for caulking the electric wire,

4 the image pickup means picks up at least one image out of an image of the pressure-
5 welding part to which the electric wire was pressure-welded and that of the caulking piece which
6 caulked the electric wire,

7 the second image consulting data includes at least one plurality of images out of images
8 of the pressure-welding part to which the electric wire was pressure-welded and those of the
9 caulking piece which caulked the electric wire, and

10 the extraction means compares at least one image out of an image of the pressure-welding
11 part to which the electric wire was pressure-welded and that of the caulking piece which caulked
12 the electric wire, which are picked up by the image pickup means, with at least one plurality of
13 images out of images of the pressure-welding part to which the electric wire was pressure-welded
14 and those of the caulking piece which caulked the electric wire, which are included in the second
15 image consulting data.

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